

GEOPHYSICAL SURVEY REPORT

Brick Kiln Road, Raunds, Northamptonshire

Client

University of Leicester Archaeological Services

For

R. Hodgson & Sons Ltd and Mr Harvey Smith

Survey Report

11955

OASIS Ref. No.

sumogeop1-514586

Date

05 April 2023



Job ref: 16999 Date: May 2022

Survey Report 11955: Brick Kiln Road, Raunds, Northamptonshire

Survey dates 3 March 2023

30 March 2023

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Report Date 05 April 2023

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3 **SURVEY TECHNIQUE**

3.1 Detailed magnetic survey (magnetometry) was chosen as the most efficient and effective method of locating the type of archaeological anomalies which might be expected at this site. All survey techniques followed the guidance set out by CIFA (2014, updated 2020), Historic England (2008), and the European Archaeology Council (EAC) (2016).

Bartington Grad 601-2	Traverse Interval 1.0m	Sample Interval 0.25m
Bartington Cart System	Traverse Interval 1.0m	Sample Interval 0.125m

The only processes performed on data are the following unless specifically stated otherwise:

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes instrument striping effects and edge
	discontinuities over the whole of the data set.
Step Correction	When gradiometer data are collected in 'zig-zag' fashion, stepping errors
(De-stagger)	can sometimes arise. These occur because of a slight difference in the
	speed of walking on the forward and reverse traverses. The result is a
	staggered effect in the data, which is particularly noticeable on linear
	anomalies. This process corrects these errors.

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4 SUMMARY OF RESULTS

4.1 A detailed magnetometer survey was conducted over approximately 6.8 hectares of land off Brick Kiln Road, Raunds and it has identified a series of adjoining rectilinear enclosures, ditches and small pit-like responses indicative of settlement activity. Former ridge and furrow cultivation has been mapped in the data, along with an old field boundary and former pond. An area of strong magnetic disturbance relates to a former brickworks.

5 INTRODUCTION

- 5.1 **SUMO Geophysics Ltd** were commissioned to undertake a geophysical survey of an area outlined for mixed use development. This survey forms part of an archaeological investigation being undertaken by **University of Leicester Archaeological Services** on behalf of **R. Hodgson & Sons Ltd and Mr Harvey Smith.**
- 5.2 Site Details

NGR / Postcode SP 9976 7368 / NN9 6BD

Location The site is located to the north of Raunds, Northamptonshire, with

Brick Kiln Road forming the southern boundary of the site. Residential properties of Kelmarsh Avenue bound the site to the west, with industrial units at New Barn Farm to the northeast and

agricultural land to the north.

HER Northamptonshire
OASIS Ref. No. sumogeop1-514586
District North Northamptonshire

Parish Raunds
Topography Mostly flat

Land Use Pasture / horse paddocks

Geology Bedrock: Oxford Clay Formation – mudstone.

(BGS 2023) Superficial: Oadby Member - diamicton is recorded over the

majority of the survey area, with Bozeat Till – diamicton present recorded over the south-eastern portion of the

site.

Soils (CU 2023) Soilscape 5: freely draining lime-rich loamy soils.

Survey Methods Magnetometer survey (fluxgate gradiometer)

Study Area c. 6.8 ha

5.3 Archaeological Background

5.3.1 North Northamptonshire Council's County Archaeologist (Mordue 2023) confirms that the site lies between two areas of urban expansion for which a good deal of archaeological work has been carried out. Immediately to the east, evaluation and excavation has demonstrated the presence of Saxon and medieval activity including structures and ovens, whilst investigative work immediately to the southeast of Area 2 has revealed further Saxon remains, including a post-built structure; however there is no indication that the settlement activity continued further to the west. Directly west of the survey area, evaluation and excavation investigated an area of Iron Age settlement, and it is noted that the Saxon and medieval occupation did not extend this

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far. Medieval ridge and furrow is recorded in Area 1, suggesting that it was used for agricultural purposes and lay outside of the focussed settlement area.

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5.4 Aims and Objectives

5.4.1 To locate and characterise any anomalies of possible archaeological interest within the study

6 **RESULTS**

6.1 The survey has been divided into five survey areas (Areas 1-5) and specific anomalies have been given numerical labels [1] [2] which appear in the text below, as well as on the Interpretation Figure(s).

6.2 Probable / Possible Archaeology

- 6.2.1 A concentration of ditch-type responses, linear trends and small pit-like anomalies [1] are visible extending across the north of Area 3 into Area 1 and are indicative of an area of former settlement activity covering an area of at least 1.6 hectares. The responses comprise adjoining rectilinear enclosures on an approximate northwest-southeast alignment, with some internal divisions and possible annexed enclosures also visible. Parallel ditch-type responses [2] to the north of the 'main' enclosures could represent a trackway.
- 6.2.2 Numerous small discrete positive anomalies have been identified, the strongest of which are located within the rectilinear enclosures and are likely to be a result of former rubbish, storage or post pits. Other discrete anomalies, particularly those outside of the enclosures, have been categorised as having a possible archaeological explanation based on the weaker magnetic response.

6.3 Uncertain

6.3.1 A negative linear trend [3] has been detected in the south of Area 3, with further linear trends in Areas 1 and 5. They have been assigned to the category of *Uncertain* as they generally lack the defined morphology of anomalies that would usually be interpreted as being of archaeological interest. The straight linear anomaly [3] is most likely to have a modern explanation and could reflect a non-ferrous pipe or former fence line, whilst the other trends are likely to be due to natural or agricultural processes.

6.4 Former Field Boundary - Corroborated

6.4.1 A short linear response [4] has been mapped in the southwest of Area 1; it corresponds with the location of a former field boundary that can be seen on historic Ordnance Survey maps of the area (Fig. 05).

6.5 Agricultural – Ridge and Furrow

6.5.1 Widely spaced, slightly curved, parallel linear anomalies have been identified in Areas 1, 3 and 4 and they are indicative of former ridge and furrow cultivation.

6.6 Natural / Geological / Pedological / Topographic

6.6.1 A weak band of slightly enhanced magnetic response is visible running east-west across the south of Area 3. It is likely to have a natural explanation and reflect localised variations in the underlying geology or superficial deposits.

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6.7 Former Brickworks

6.7.1 Strong magnetic debris and disturbance, indicative of made ground, is present across the whole of Area 2; it corresponds with the site of a former brickworks that is marked on historic Ordnance Survey mapping (Fig. 05).

6.8 Ferrous / Magnetic Disturbance

- 6.8.1 A discrete area of strong magnetic disturbance can be seen in the north of Area 3 and is a result of a former pond. The pond is visible as such on historic maps and as an earthwork depression on aerial imagery (Fig. 05).
- 6.8.2 Ferrous responses close to boundaries are due to adjacent fences and gates. Smaller scale ferrous anomalies ("iron spikes") are present throughout the data and are characteristic of small pieces of ferrous debris (or brick / tile) in the topsoil; they are commonly assigned a modern origin. Only the most prominent of these are highlighted on the interpretation diagram.

7 DATA APPRAISAL & CONFIDENCE ASSESSMENT

7.1 Historic England guidelines (EH 2008) Table 4 states that the typical magnetic response on the local soils / geology is variable, whilst the disturbance from the former brickworks has the potential to mask archaeological features, should they be present. The results from this survey indicate the presence of rectilinear enclosures and pit-like responses indicative of settlement activity and there is no *a priori* reason why archaeological features would not have been detected.

8 CONCLUSION

8.1 The magnetometer survey at Brick Kiln Road, Raunds has recorded a complex of ditch-type responses which have been interpreted as being of definite archaeological origin. A series of adjoining rectilinear enclosures, ditches, pits and a probable trackway have been mapped and are indicative of an area of former occupation. Additional weaker linear trends and small discrete anomalies could represent further ditches or pits, whilst others have an uncertain origin and could simply be natural or agricultural. Ridge and furrow is mapped in the data, along with an old field boundary, former pond and area of disturbance associated with a 19th century brickworks.

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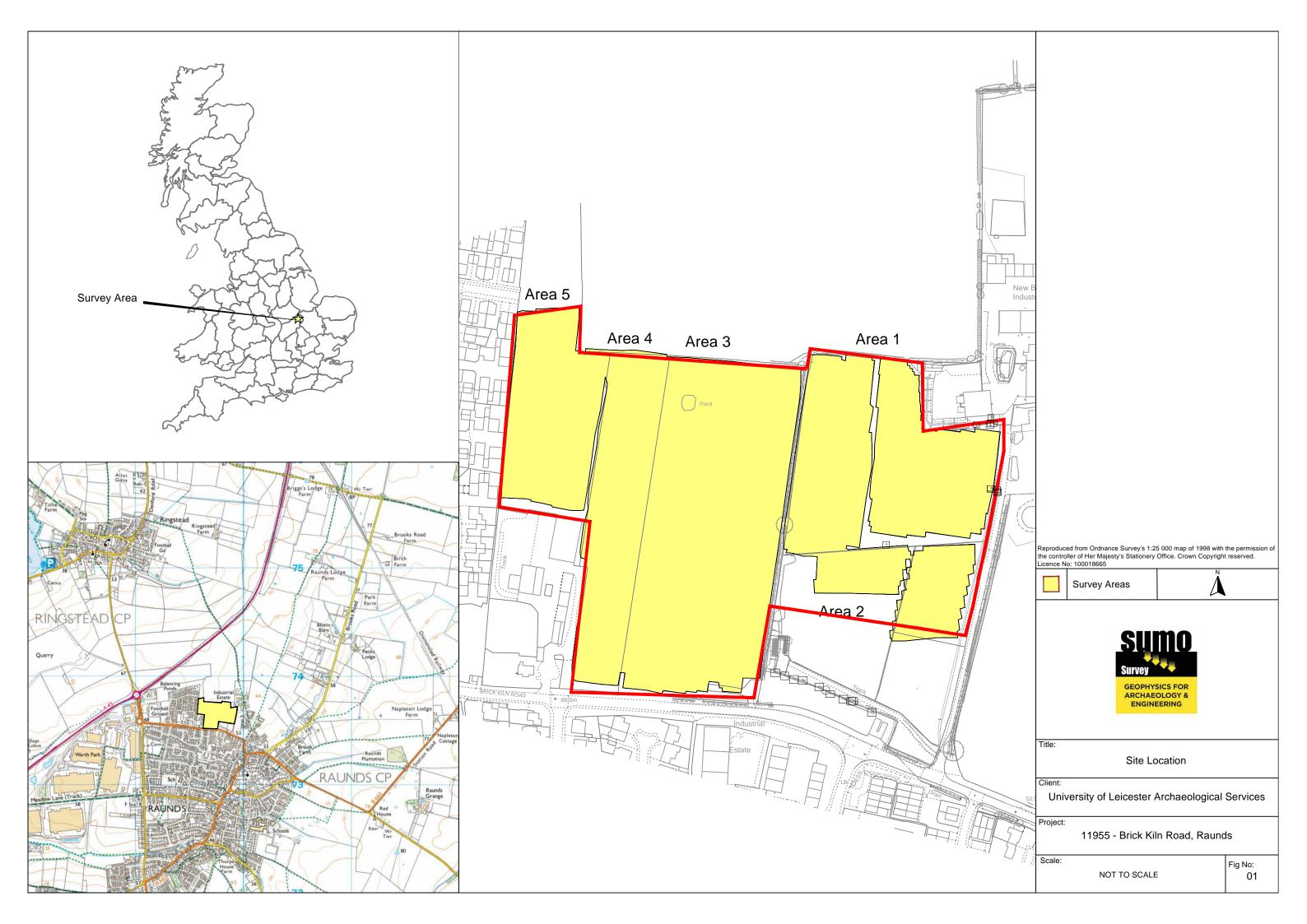
9 **REFERENCES**

BGS 2022	British Geological Survey, Geology of Britain viewer [accessed 05/042023] website: (http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps)
ClfA 2014 Amended	Standard and Guidance for Archaeological Geophysical Survey. Amended 2020. CIfA Guidance note. Chartered Institute for Archaeologists, Reading https://www.archaeologists.net/sites/default/files/CIfAS%26GGeophysics 3.pdf
2020 CU 2022	The Soils Guide. Available: www.landis.org.uk. Cranfield University, UK. [accessed
-10	05/04/2023] website: http://mapapps2.bgs.ac.uk/ukso/home.html
EAC 2016	EAC Guidelines for the Use of Geophysics in Archaeology, European Archaeological Council, Guidelines 2.
EH 2008	Geophysical Survey in Archaeological Field Evaluation. English Heritage, Swindon (now withdrawn, but used for evaluating suitability of soil types)
Mordue. L, 2023	Letter to Alan Brown, 14 February.

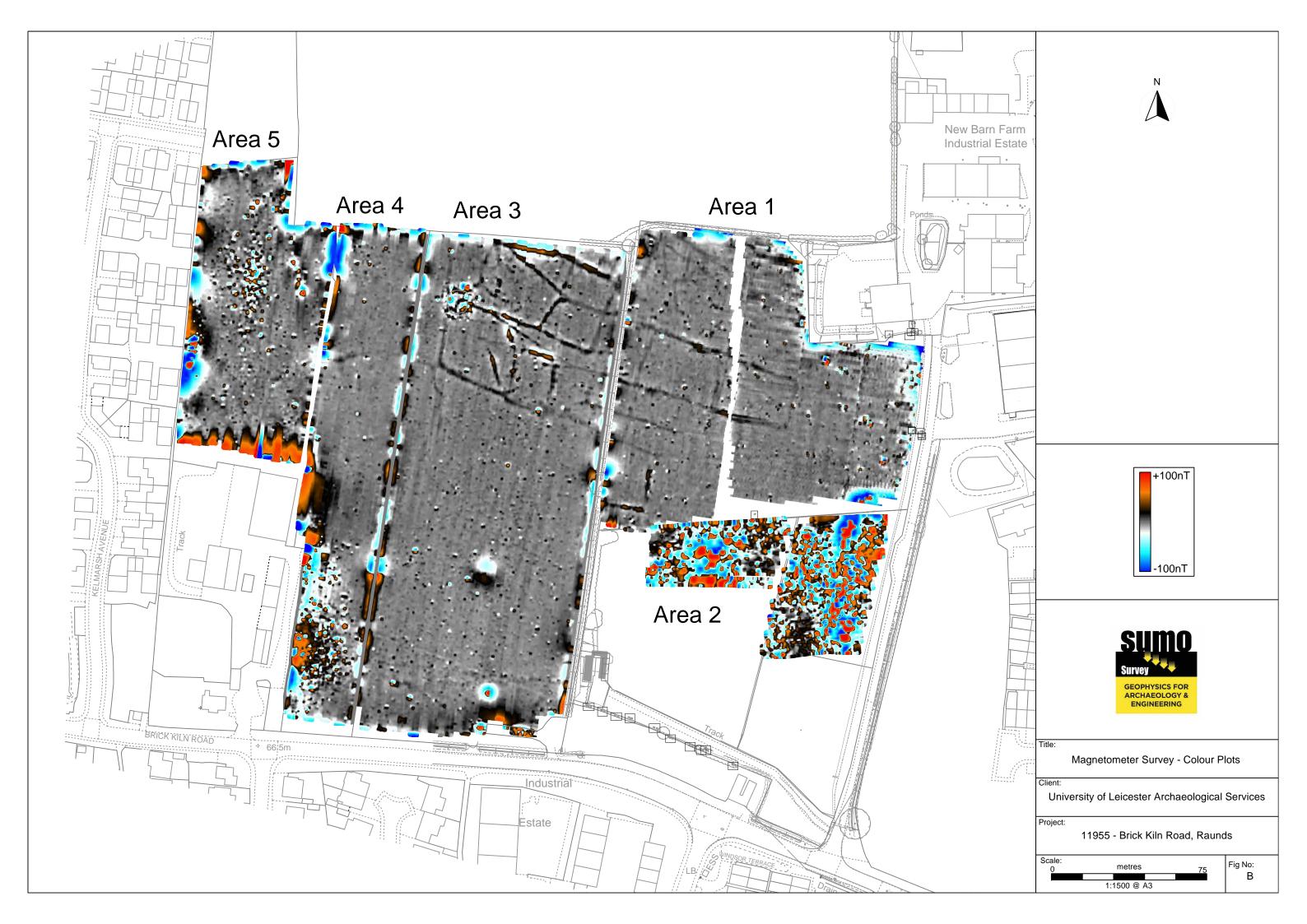
10 **ARCHIVE**

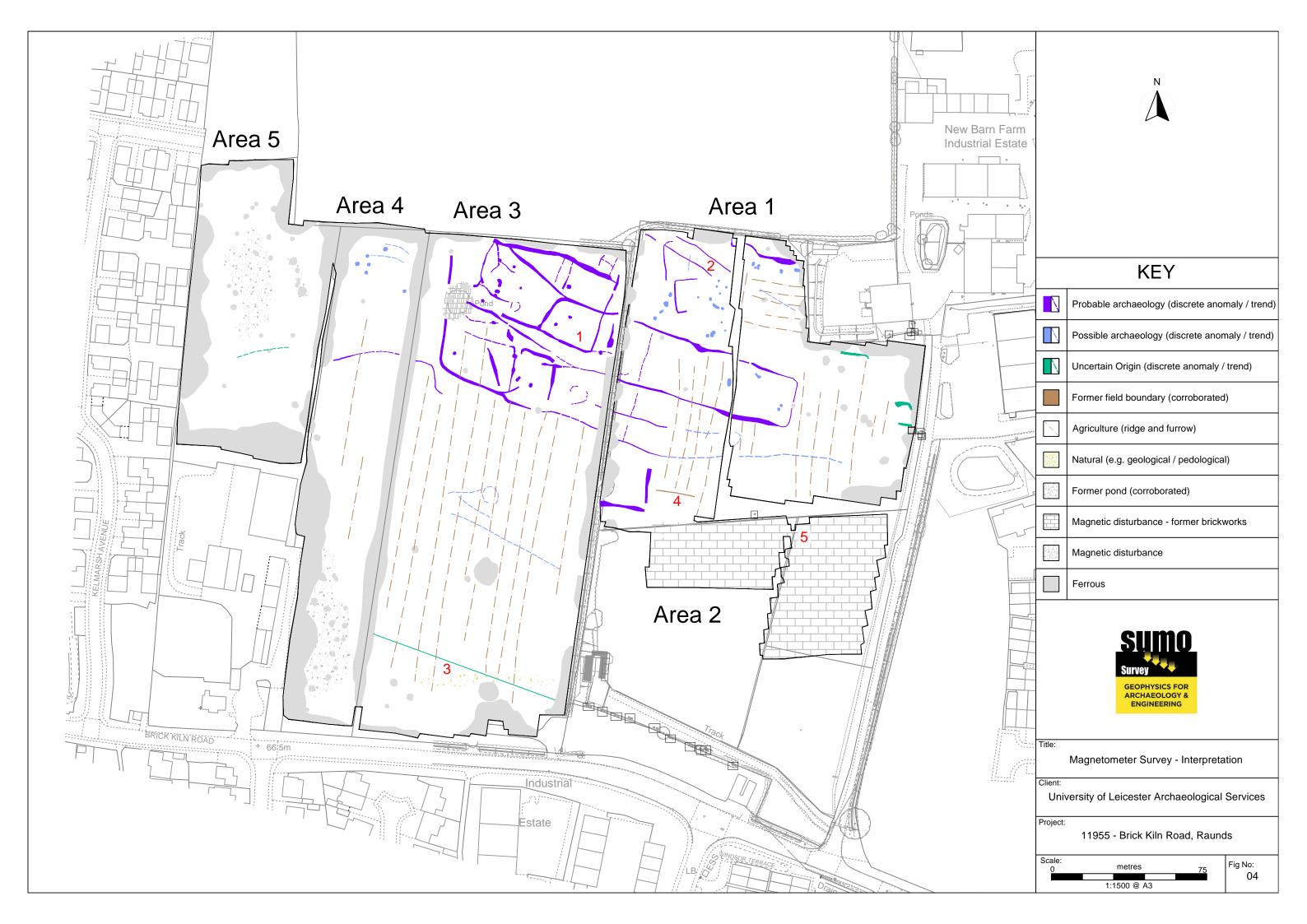
- The minimally processed data, data images, XY traces and a copy of this report are stored in 10.1 SUMO Geophysics Ltd.'s digital archive, on an internal RAID configured NAS drive in the Midlands Office. These data are also backed up to the Cloud for off-site storage.
- 10.2 The Grey Literature will be archived with OASIS and the relevant HER within a period of 12 months.

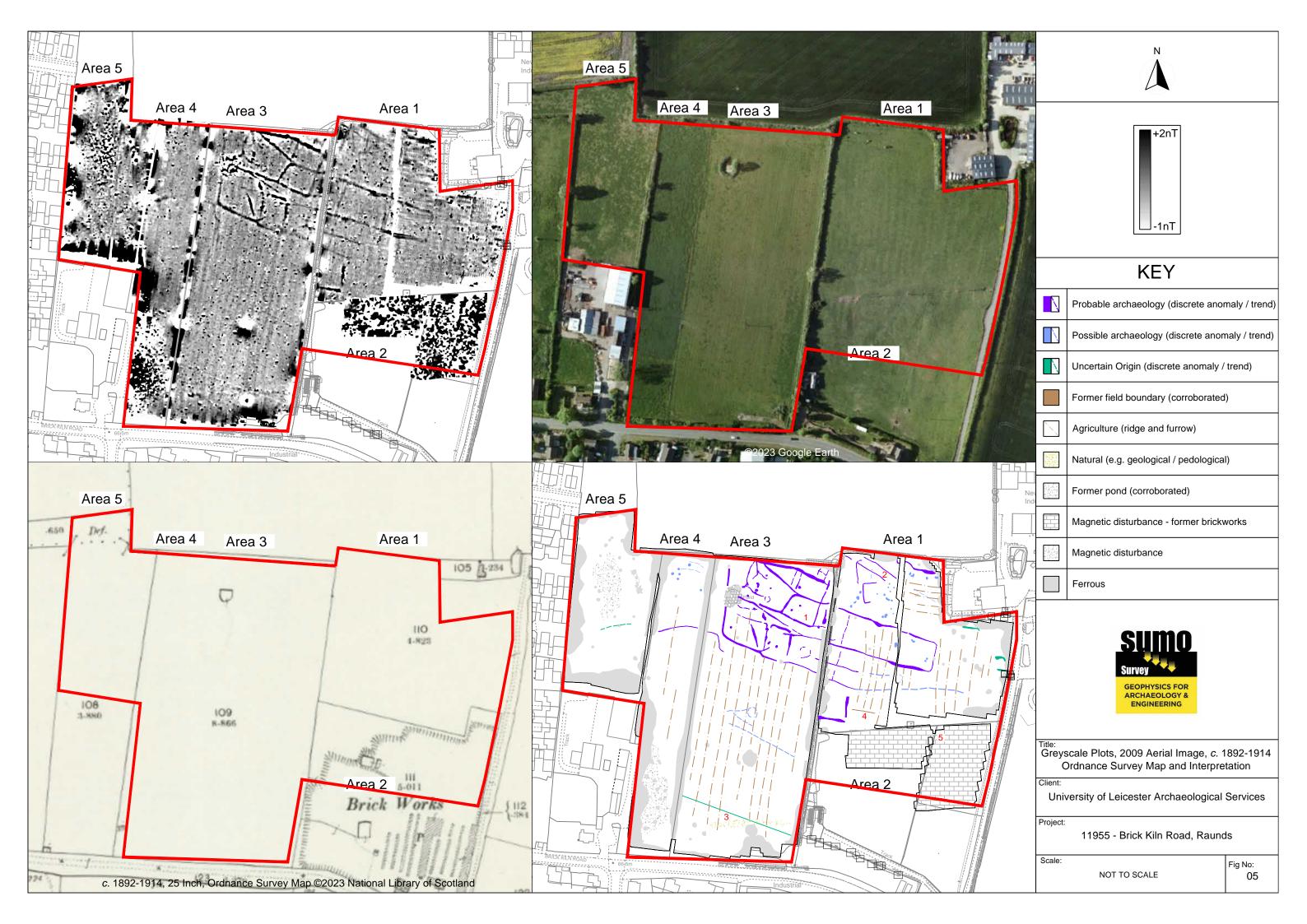
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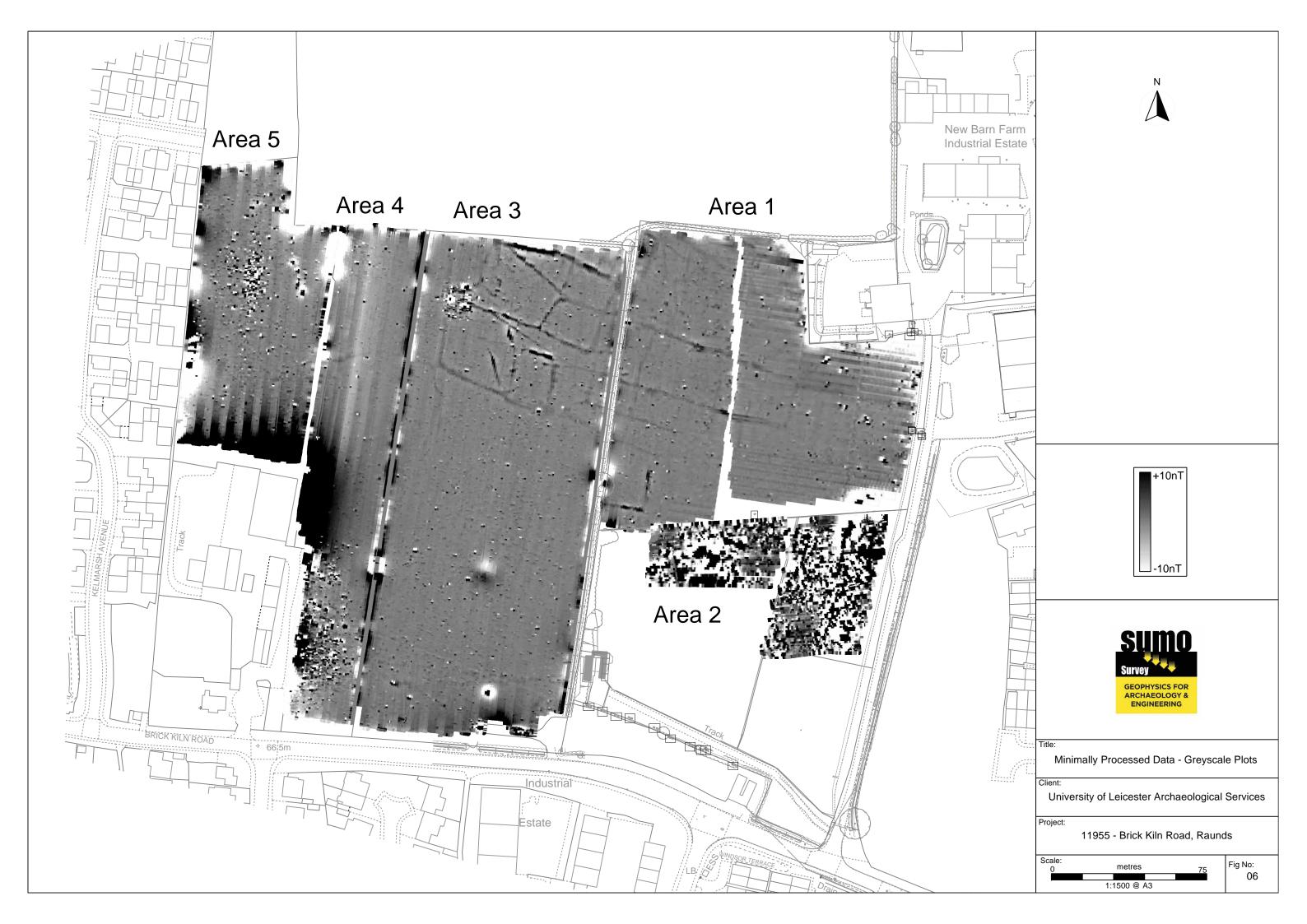














Standards & Guidance

This report and all fieldwork have been conducted in accordance with the latest guidance documents issued by Historic England (EH 2008) (then English Heritage), the Chartered Institute for Archaeologists (ClfA 2014) and the European Archaeological Council (EAC 2016).

Grid Positioning

For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station rebroadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

Instrumentation: Bartington *Grad* 601-2

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each site survey, data is transferred to the office for processing and presentation.

Data Processing

Zero Mean Traverse This process sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set

Step Correction (De-stagger)

When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

Display

Greyscale/ Colourscale Plot This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly, all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.

Presentation of results and interpretation

The presentation of the results includes a 'minimally processed data' and a 'processed data' greyscale plot. Magnetic anomalies are identified, interpreted and plotted onto the 'Interpretation' drawings.

When interpreting the results, several factors are taken into consideration, including the nature of archaeological features being investigated and the local conditions at the site (geology, pedology, topography etc.). Anomalies are categorised by their potential origin. Where responses can be related to other existing evidence, the anomalies will be given specific categories, such as: Abbey Wall or Roman Road. Where the interpretation is based largely on the geophysical data, levels of confidence are implied, for example: Probable, or Possible Archaeology. The former is used for a confident interpretation, based on anomaly definition and/or other corroborative data such as cropmarks. Poor anomaly definition, a lack of clear patterns to the responses and an absence of other supporting data reduces confidence, hence the classification Possible.

Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk-based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, Roman Road, Wall, etc.) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

Archaeology / Probable Archaeology

This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.

Possible Archaeology These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.

Industrial / Burnt-Fired Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metalworking areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.

Former Field & possible)

Anomalies that correspond to former boundaries indicated on historic mapping, or Boundary (probable which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.

Ridge & Furrow

Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases, the response may be the result of more recent agricultural activity.

Agriculture (ploughing) Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.

Land Drain

Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.

Natural

These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.

Magnetic Disturbance Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present.

Service

Magnetically strong anomalies, usually forming linear features are indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.

Ferrous

This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

Uncertain Origin

Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of Possible Archaeology / Natural or (in the case of linear responses) Possible Archaeology /

Agriculture; occasionally they are simply of an unusual form.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

Appendix B - Technical Information: Magnetic Theory

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns; material such as brick and tile may be magnetised through the same process.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

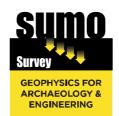
Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried feature. The difference between the two sensors will relate to the strength of a magnetic field created by this feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services.



Summary for sumogeop1-514586

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OASIS ID (UID)	· ' ' · ' · ' · ' · ' · ' · ' · · · · ·	
Project Name	Geophysical Survey, Magnetometry Survey at Brick Kiln Road, Raunds	
Sitename	Brick Kiln Road, Raunds	
Activity type	Geophysical Survey, Magnetometry Survey, MAGNETOMETRY SURVEY	
Project Identifier(s)	11955	
Planning Id		
Reason For Investigation	Planning requirement	
Organisation Responsible for work	SUMO Geophysics Ltd.	
Project Dates	03-Mar-2023 - 30-Mar-2023	
Location	Brick Kiln Road, Raunds	
	NGR : SP 99753 73672	
	LL: 52.35205277325717, -0.536850539329015	
	12 Fig : 499753,273672	
Administrative Areas	Country : England	
	County: Northamptonshire	
	District : East Northamptonshire	
	Parish : Raunds	
Project Methodology	Detailed magnetic survey (magnetometry) was chosen as the most efficient and effective method of locating the type of archaeological anomalies which might be expected at this site. All survey techniques followed the guidance set out by CIFA (2014, updated 2020), Historic England (2008), and the European Archaeology Council (EAC) (2016).	
Project Results	A detailed magnetometer survey was conducted over approximately 6.8 hectares of land off Brick Kiln Road, Raunds and it has identified a series of adjoining rectilinear enclosures, ditches and small pit-like responses indicative of settlement activity. Former ridge and furrow cultivation has been mapped in the data, along with an old field boundary and former pond. An area of strong magnetic disturbance relates to a former brickworks	
Keywords	Ditched Enclosure - LATER PREHISTORIC - FISH Thesaurus of	
	Monument Types	
Funder		
HER	Northamptonshire SMR - unRev - STANDARD	
Person Responsible for work		
HER Identifiers		
Archives		



- Laser Scanning
- Archaeological Geophysical Measured Building Topographic

 - Utility Mapping

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